

# NATIONAL BUREAU OF STANDARDS REPORT

8351

Interlaboratory Intercomparisons  
of  
200-Watt Incandescent Lamps

by

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Photometry and Colorimetry Section  
Metrology Division



U. S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

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\* NBS Group, Joint Institute for Laboratory Astrophysics at the University of Colorado.

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Interlaboratory Intercomparisons  
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ABSTRACT

A group of six clear and five inside-frosted, 200-watt incandescent lamps were measured by each of nine laboratories. The voltage across each lamp was held at 120.0 volts while the luminous flux and current were measured. The results of the measurements made by the individual laboratories and an analysis of the results are given in this report.

I. Introduction

This intercomparison was undertaken to determine the uniformity of measurements on 200-watt incandescent lamps made at the participating laboratories. The laboratories participating and the order of the measurements are as follows:

1. National Bureau of Standards
2. Electrical Testing Laboratories
3. Duro Test
4. Westinghouse
5. Sylvania
6. Champion
7. El Tronics
8. General Electric
9. Verd-A-Ray
10. National Bureau of Standards

The intercomparison was started with six clear and six inside-frosted lamps; however, one inside-frosted lamp lost its base early in the intercomparison.

The National Bureau of Standards measured the lamps before and after the other laboratories measured them. The clear lamps appear to have dropped in lumen output between the two measurements by 0.68%. The frosted lamps measured the same before and after they were measured by the other laboratories. The values reported in the tables for the National Bureau of Standards measurements is the average of the before and after measurements. Lamp Number NBS 6806 burned out during the last measurement at the National Bureau of Standards.



Lumens  
Clear Bulb Lamps

| Lamp No.             | NBS    | ETL    | Duro T     | West   | Syl    | Champ  | E1 T   | GE     | V-A-R  | Av.    |
|----------------------|--------|--------|------------|--------|--------|--------|--------|--------|--------|--------|
| NBS 7258             | 3640   | 3646   | 3680       | 3653   | 3641   | 3656   | 3628   | 3659   | 3652   | 3650.6 |
| NBS 7259             | 3656   | 3654   | 3700       | 3673   | 3668   | 3662   | 3625   | 3676   | 3681   | 3666.1 |
| NBS 7260             | 3680   | 3679   | 3734       | 3698   | 3695   | 3695   | 3652   | 3696   | 3710   | 3693.2 |
| NBS 7261             | 3658   | 3671   | 3714       | 3681   | 3665   | 3675   | 3643   | 3678   | 3655   | 3671.1 |
| NBS 7262             | 3642   | 3667   | 3703       | 3672   | 3638   | 3635   | 3603   | 3642   | 3642   | 3649.3 |
| NBS 7263             | 3674   | 3679   | 3720       | 3687   | 3680   | 3675   | 3654   | 3671   | 3657   | 3677.4 |
| Av.                  | 3658.3 | 3666.0 | 3708.5     | 3677.3 | 3664.5 | 3666.3 | 3634.2 | 3670.3 | 3666.2 | 3668.0 |
| $\Delta$             | - 9.7  | - 2.0  | +40.5      | + 9.3  | - 3.5  | - 1.7  | -33.8  | + 2.3  | - 1.8  |        |
| % $\Delta$           | - 0.26 | - 0.05 | + 1.10     | + 0.25 | - 0.10 | - 0.05 | - 0.92 | + 0.06 | - 0.05 |        |
| Inside-Frosted Lamps |        |        |            |        |        |        |        |        |        |        |
| NBS 6800             | 3701   | 3699   | loose base |        |        |        |        |        |        |        |
| NBS 6801             | 3650   | 3654   | 3705       | 3653   | 3683   | 3675   | 3645   | 3665   | 3678   | 3667.6 |
| NBS 6802             | 3694   | 3691   | 3739       | 3701   | 3734   | 3712   | 3695   | 3712   | 3715   | 3710.3 |
| NBS 6803             | 3676   | 3675   | 3727       | 3678   | 3703   | 3690   | 3678   | 3699   | 3695   | 3691.2 |
| NBS 6805             | 3738   | 3744   | 3791       | 3748   | 3764   | 3768   | 3745   | 3760   | 3760   | 3757.6 |
| NBS 6806             | 3691   | 3691   | 3733       | 3705   | 3719   | 3718   | 3693   | 3716   | 3718   | 3709.3 |
| Av. of 5             | 3689.8 | 3691.0 | 3739.0     | 3697.0 | 3720.6 | 3712.6 | 3691.2 | 3710.4 | 3713.2 | 3707.2 |
| $\Delta$             | -17.4  | -16.2  | +31.8      | -10.2  | +13.4  | + 5.4  | -16.0  | + 3.2  | + 6.0  |        |
| % $\Delta$           | - 0.47 | - 0.44 | + 0.86     | - 0.28 | + 0.36 | - 0.15 | - 0.43 | + 0.09 | + 0.16 |        |





Table 2.

## Current in Amperes

## Clear Bulb Lamps

| Lamp No.   | NBS     | ETL     | Duro T  | West    | Syl     | Champ   | El T    | GE      | V-A-R   | Av.    |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| NBS 7258   | 1.663   | 1.664   | 1.664   | 1.663   | 1.664   | 1.665   | 1.660   | 1.661   | 1.66    | 1.6627 |
| NBS 7259   | 1.670   | 1.670   | 1.670   | 1.670   | 1.670   | 1.670   | 1.665   | 1.669   | 1.67    | 1.6693 |
| NBS 7260   | 1.671   | 1.672   | 1.672   | 1.672   | 1.673   | 1.675   | 1.669   | 1.671   | 1.67    | 1.6717 |
| NBS 7261   | 1.667   | 1.668   | 1.668   | 1.669   | 1.668   | 1.670   | 1.662   | 1.670   | 1.67    | 1.6680 |
| NBS 7262   | 1.665   | 1.668   | 1.667   | 1.668   | 1.666   | 1.670   | 1.661   | 1.662   | 1.67    | 1.6663 |
| NBS 7263   | 1.676   | 1.679   | 1.680   | 1.677   | 1.676   | 1.680   | 1.675   | 1.678   | 1.68    | 1.6779 |
| Av.        | 1.6687  | 1.6702  | 1.6702  | 1.6698  | 1.6695  | 1.6717  | 1.6653  | 1.6685  | 1.6700  | 1.6693 |
| $\Delta$   | -0.0006 | +0.0009 | +0.0009 | +0.0005 | +0.0002 | +0.0024 | -0.0040 | -0.0008 | +0.0007 |        |
| % $\Delta$ | -0.04   | +0.05   | +0.05   | +0.03   | +0.01   | +0.14   | -0.24   | -0.05   | +0.04   |        |

## Inside-Frosted Lamps

|            |         |         |         |         |         |         |         |         |         |        |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| NBS 6800   | 1.652   | 1.653   |         |         |         |         |         |         |         |        |
| NBS 6801   | 1.650   | 1.651   | 1.650   | 1.650   | 1.651   | 1.650   | 1.649   | 1.650   | 1.66    | 1.6512 |
| NBS 6802   | 1.648   | 1.648   | 1.649   | 1.649   | 1.649   | 1.650   | 1.643   | 1.650   | 1.65    | 1.6484 |
| NBS 6803   | 1.658   | 1.658   | 1.660   | 1.657   | 1.658   | 1.660   | 1.658   | 1.659   | 1.66    | 1.6587 |
| NBS 6805   | 1.647   | 1.647   | 1.650   | 1.647   | 1.647   | 1.650   | 1.643   | 1.648   | 1.66    | 1.6488 |
| NBS 6806   | 1.649   | 1.650   | 1.652   | 1.649   | 1.650   | 1.650   | 1.649   | 1.650   | 1.66    | 1.6510 |
| Av. of 5   | 1.6504  | 1.6508  | 1.6522  | 1.6504  | 1.6510  | 1.6520  | 1.6484  | 1.6514  | 1.658   | 1.6516 |
| $\Delta$   | -0.0012 | -0.0008 | +0.0006 | -0.0012 | -0.0006 | +0.0004 | -0.0032 | -0.0002 | +0.0064 |        |
| % $\Delta$ | -0.07   | -0.05   | +0.04   | -0.07   | -0.04   | +0.02   | -0.19   | -0.01   | +0.39   |        |



Table 3.

Lumens per Watt

Clear Bulb Lamps

| Lamp No. | NBS   | ETL   | Duro T | West  | Syl   | Champ | El T  | GE    | V-A-R | Av.   |
|----------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|
| NBS 7258 | 18.24 | 18.26 | 18.43  | 18.31 | 18.23 | 18.30 | 18.21 | 18.36 | 18.33 | 18.30 |
| NBS 7259 | 18.24 | 18.23 | 18.46  | 18.33 | 18.30 | 18.27 | 18.14 | 18.35 | 18.37 | 18.30 |
| NBS 7260 | 18.35 | 18.34 | 18.61  | 18.43 | 18.41 | 18.38 | 18.23 | 18.43 | 18.51 | 18.41 |
| NBS 7261 | 18.29 | 18.34 | 18.56  | 18.38 | 18.31 | 18.34 | 18.27 | 18.35 | 18.24 | 18.34 |
| NBS 7262 | 18.23 | 18.32 | 18.51  | 18.35 | 18.20 | 18.14 | 18.08 | 18.26 | 18.17 | 18.25 |
| NBS 7263 | 18.27 | 18.26 | 18.45  | 18.32 | 18.30 | 18.23 | 18.18 | 18.23 | 18.14 | 18.26 |
| Av.      | 18.27 | 18.29 | 18.50  | 18.35 | 18.29 | 18.28 | 18.18 | 18.33 | 18.29 | 18.31 |
| Δ        | - .04 | - .02 | + .19  | + .04 | - .02 | - .03 | - .13 | + .02 | - .02 |       |
| % Δ      | - .22 | - .11 | + 1.04 | + .22 | - .11 | - .16 | - .71 | + .11 | - .11 |       |

Inside Frosted Lamps

|          |       |       |       |       |       |       |       |       |       |       |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| NBS 6800 | 18.67 | 18.65 |       |       |       |       |       |       |       |       |
| NBS 6801 | 18.43 | 18.44 | 18.71 | 18.45 | 18.59 | 18.56 | 18.42 | 18.51 | 18.46 | 18.51 |
| NBS 6802 | 18.68 | 18.66 | 18.90 | 18.70 | 18.87 | 18.75 | 18.74 | 18.75 | 18.76 | 18.76 |
| NBS 6803 | 18.48 | 18.47 | 18.71 | 18.50 | 18.61 | 18.52 | 18.49 | 18.58 | 18.55 | 18.55 |
| NBS 6805 | 18.91 | 18.94 | 19.15 | 18.96 | 19.04 | 19.03 | 18.99 | 19.01 | 18.88 | 18.99 |
| NBS 6806 | 18.65 | 18.64 | 18.83 | 18.72 | 18.78 | 18.78 | 18.66 | 18.77 | 18.66 | 18.72 |
| Av. of 5 | 18.63 | 18.63 | 18.86 | 18.67 | 18.78 | 18.73 | 18.66 | 18.72 | 18.66 | 18.70 |
| Δ        | - .07 | - .07 | + .16 | - .03 | + .08 | + .03 | - .04 | + .02 | - .04 |       |
| % Δ      | - .37 | - .37 | + .86 | - .16 | + .43 | + .16 | - .21 | + .11 | - .21 |       |



Figure 1  
Lumens  
Clear Bulb Lamps

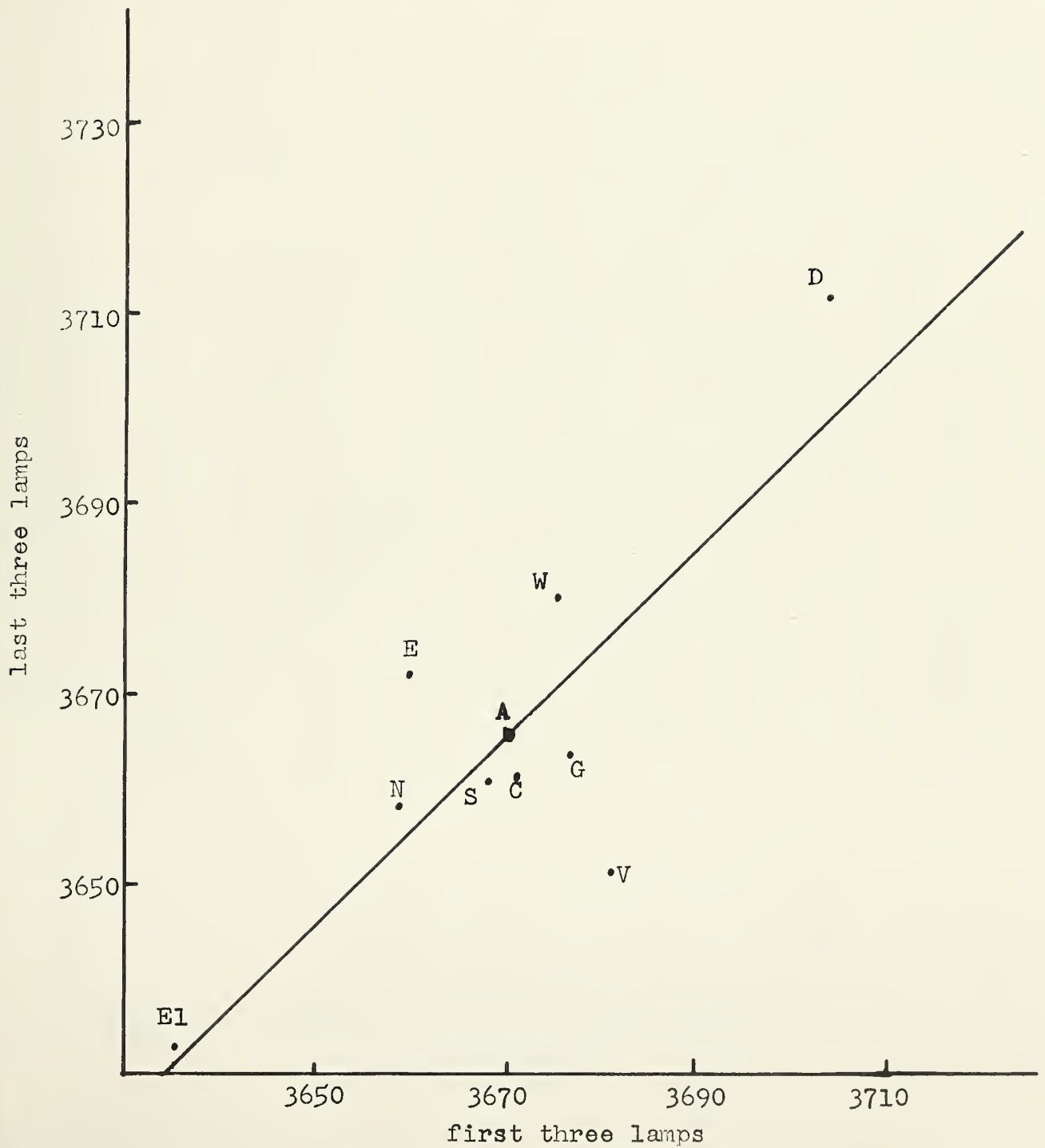




Figure 2  
Lumens  
Inside-Frosted Lamps

